In his twenty-five years of service he had been on duty on nearly twenty different stations, scattered from coast to coast and from arctic seas to the Gulf of Mexico. His labors from 1883 to 1886 at St. Micheals, Alaska, the farthest north of the weather stations, were particularly appreciated and valued.

He was a polished gentleman, genial, cheerful, and generous, and easily won his way in the esteem of the communities to which the service called him. He was industrious and efficient, and was frequently commended for the accuracy of his meteorological work.

EARTHQUAKES OF JUNE 25 AND 26, 1904.

By Prof. C. F. MARVIN.

The seismograph at the Weather Bureau recorded an earthquake on June 25, beginning at 4 hours, 12 minutes, 31 seconds, p. m., and another on June 26, beginning at 7 hours, 21 minutes, 3 seconds, p. m. The record in both cases indicated a very slight displacement of the earth at Washington, but the character of the records is such that we believe the origins were at very great distances and seemingly nearly the same for both earthquakes. The disturbances of themselves were probably of considerable violence.

In the record of the first earthquake, especially, the amplitude of the movement at Washington was very small, and exact measurements of the record can not be made The different phases ordinarily characteristic of earthquake records from instruments of this class are more clearly defined in the second than in the first earthquake.

The Omori seismograph, by which these records were made, was fully described and illustrated in the MONTHLY WEATHER REVIEW for June, 1903, page 271.

The following table gives the times of the principal features of both records. The north and south component of horizontal motion only is recorded.

Earthquakes of June 25 and 26, 1904, p. m., seventy-fifth meridian time.

	June 25.			June 26.		
	h.	*m.*	*s.*	*h.*	*m.*	*s.*
First preliminary tremors	4	12	31 p. m.	7	21	03 p. m.
Second preliminary tremors	—	—	— p. m.	7	46	56 p. m.
Principal portion began	4	44	59 p. m.	7	55	26 p. m.
Principal portion ended	4	55	46 p. m.	7	57	01 p. m.
Maximum waves at	4	50	36 p. m.	7	55	56 p. m.
	4	53	24 p. m.			
End of earthquake	5	29	04 p. m.	8	25	09 p. m.
Duration of first preliminary tremor		32	28		34	23
Average period of complete waves in principal portion			20			20
Period of pendulum			26			26
Maximum double amplitude of actual displacement of earth at seismograph						0. 26 mm.
Magnification of record						10

STUDIES ON THE CIRCULATION OF THE ATMOSPHERES OF THE SUN AND OF THE EARTH.

VII.—THE AVERAGE MONTHLY VECTORS OF THE GENERAL CIRCULATION IN THE UNITED STATES.

By Prof. FRANK H. BIGELOW.

In Table 9, page 144, Annual Report of the Chief of the Weather Bureau, 1898–1899, may be found the data resulting from the nephoscope observations taken in the international cloud year, 1896–1897, which were made to determine the general motions of the atmosphere over the United States. In Table 33, page 409, of the same volume, is given a summary of the resulting general velocities as annual normals. It remains to compute the mean monthly normal vectors of the circulation, and it has been done by the methods used in computing similar vectors for the West Indies, so that but few preliminary remarks are needed in this connection. The method now in use in the Weather Bureau of determining the monthly direction of the wind at a station is really inadequate to the requirements of modern science, which demands an accurate knowledge of the azimuth direction and velocity of the wind. The method referred to consists in counting the number of times the wind was reported on each of the eight cardinal points, N., NE., E., etc., and assigning as the monthly direction that which has the plurality of numbers. This gives no true resultant direction and takes no account of the velocity of the wind prevailing at each observation. A second method of reducing wind observations, which is somewhat more accurate than the former, consists in assuming an equal velocity for each wind and combining the frequency numbers by using Lambert's formula or its equivalent. This system gives a true resultant direction for winds of uniform velocity, but where the winds are variable in force, as well as in direction, this is also insufficient. Many examples of inaccurate resultants can be given when the individual velocities are not constantly the same.

The vectors of Table 16, and figs. 77 to 88, Charts XI, XII, and XIII, "Average monthly vectors of the general circulation," have been computed accurately by resolving each vector $V_1 \varphi$, as observed, into its north to south and west to east components, taking the algebraic sum of each, and thence computing the mean component for the series, in this case for each month of the year. Then the resultant vectors in velocity and azimuth were constructed, and appear in Table 16 under the columns V, φ. Since the resultant vectors in the lower cloud level and at the surface are very small, I have also computed the mean motion of the wind for each month without regard to the azimuth direction, and this is given under V_1. In the middle and the upper cloud strata the azimuth directions are not so variable as nearer the surface, and hence, there is less difference between the values of V_1 and V. The resultant vectors V, φ have been plotted in two arrangements, the first giving the vectors of the month for each cloud system terminating on the same vertical lines, which permits a ready inspection of the relative motion in the different levels for each month of the year. The second arrangement gives the vectors for June ending on one vertical line, while those for the other months follow in a broken line, which shows at a glance the trend of the circulation throughout the year in the several cloud groups. It has been convenient to divide the clouds into three groups, (1) the lower clouds (stratus, cumulus, stratocumulus), (2) the middle clouds (alto-stratus, alto-cumulus), and (3) the upper clouds (cirro-cumulus, cirro-stratus, cirrus), which do not differ greatly among themselves in velocity. The average height of group (1), lower clouds, is 2000 meters; of group (2), middle clouds, 5000 meters, and of group (3), upper clouds, 9000 meters, as determined by the theodolite observations at Washington, in 1896–1897.

We make the following remarks on the vectors of Charts XI to XIII. The northern group of stations, St. Paul, Detroit, Cleveland, Buffalo, Louisville, Blue Hill, Washington, Waynesville, and Ocean City, all lie in the strong eastward drift to the north of the high pressure belt of the general circulation; Kansas City, Abilene, and Vicksburg, lie in the midst of this belt, while Key West is on the southern border of it and has some of the characteristics of the West Indian group of stations. The northern stations in the upper levels have strong eastward components, and in the lower levels a turbulent circulation with small resultant vectors. Louisville seems to have something like a personal equation, which has magnified the vectors a little above the apparent average that the entire set would suggest, while Cleveland, on the other hand, seems to have a diminished set of vectors. It is not possible to show from the observations what change, if any, ought to be introduced by means of a modifying factor. Besides the relative lengths of the vectors in the different levels it is interesting to note the north and south components at the several stations. Thus, at St. Paul and also at Kansas City, there is a northward component in the cirrus levels; this component prevails at all levels at Abilene. At Vicksburg the vectors are generally small, and they are westward during certain months